Material and Processing Technology Information System (MAPTIS) and the Integration of Restricted Materials-Chemicals

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NASA – MSFC MAPTIS

www.maptis.nasa.gov

- MAPTIS is a NASA-wide materials database established for the purpose of recording and disseminating material information to help assure safe material selections for NASA-produced hardware
- We have 3200+ users from NASA and contractors
- 500+ companies and universities use this website from all over the world

MAPTIS - History

- **While materials selection has always been an integral part of hardware design, the importance of selection of proper materials in space craft design took on greater importance after the Apollo I accident:**
  - **Finding: "An extensive distribution of combustible materials in the cabin." – *Report of Apollo 204 Review Board, Page 5-12.***
  - **Recommendation: "The amount and location of combustible materials in the Command Module must be severely restricted and controlled." - *Report of Apollo 204 Review Board, Page 6-1.***

MAPTIS – History cont.

- **MAPTIS: A database version of**
  - **JSC-08692 (Thermal Vacuum Stability)**
  - **MSFC-HDBK-527/JSC-02681 (Stress Corrosion Cracking, Toxicity, etc)**
  - **Various other materials lists**
- **Several platforms used during the mid 1980's, including cardfiles, PDP machines, and early DEC and PC-AT platforms**
- **First "query-able" version with user terminal access was on a VAX 8650.**
- **MAPTIS was "coming on line" at the time of the Challenger accident (1986), and was instrumental in determining where certain materials were used.**
- **MAPTIS is now hosted on a Windows platform.**

MAPTIS – History continued

www.maptis.nasa.gov

- In support of Return to Flight, MAPTIS was used to collect and distribute the results on compression, crush, and tensile tests performed on various ablators and foams. These tests were conducted to generate data needed to model foam events, a recommendation of the Columbia Accident Investigation Board. The data in this database was generated here at Marshall and Langley.
- Fires have occurred in several Shuttle processing facilities at KSC that were traced to the use of PFA's (**P**lastic Foams, **F**ilms and **A**dhesives) that were not certified. One of the Inspector General's recommendations is that certification data be kept in a central location so that it can be readily accessed. MAPTIS was selected for this repository.

MAPTIS – History cont.

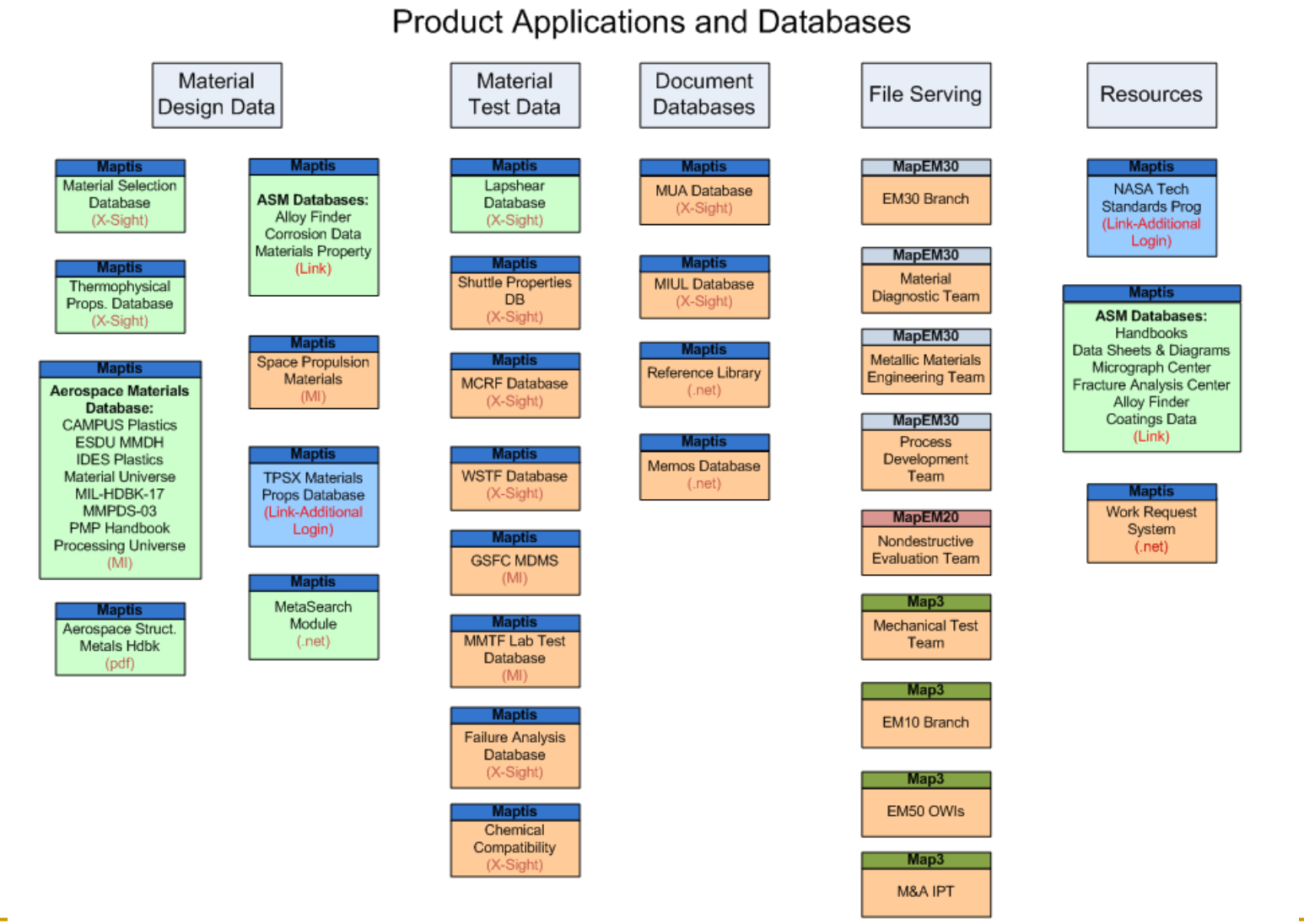
- **All materials used in NASA manned space hardware must meet acceptance criteria:**
  - **Acceptable ratings, taking into account**
    - **Environment material will experience**
    - **How the material will be used**
  - **Acceptance criteria is specified in a variety of standards, including the Selection List and NASA-STD-6001**
  - **If the desired material does have an acceptable rating for the intended use, but can be show to pose no risk, it can be used, but must have proper acceptance documentation**

MAPTIS Database

www.maptis.nasa.gov

- MAPTIS distributes in-house data from Marshal Space Flight Center, Goddard Space Flight Center, White Sands, Johnson Space Center, Kennedy Space Center, and others
- MAPTIS distributes commercial databases from ASM International and Granta (Aero USA)
  - ASM Handbooks
  - MMPDS (formerly MIL-HDBK-5)
  - Others

MAPTIS


Product Applications and Databases
Material Design Data
Maptis
Material Selection Database
(X-Sight)
Maptis
Thermophysical Props. Database
(X-Sight)
Maptis
Aerospace Materials Database:
CAMPUS Plastics
ESDU MMDH
IDES Plastics
Material Universe
MIL-HDBK-17
MMPDS-03
PMP Handbook
Processing Universe
(MI)
Maptis
Aerospace Struct. Metals Hdbk
(pdf)
Maptis
ASM Databases:
Alloy Finder
Corrosion Data
Materials Property
(Link)
Maptis
Space Propulsion Materials
(MI)
Maptis
TPSX Materials Props Database
(Link-Additional Login)
Maptis
MetaSearch Module
(.net)
Material Test Data
Maptis
Lapshear Database
(X-Sight)
Maptis
Shuttle Properties DB
(X-Sight)
Maptis
MCRF Database
(X-Sight)
Maptis
WSTF Database
(X-Sight)
Maptis
GSFC MDMS
(MI)
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MMTF Lab Test Database
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Maptis
Failure Analysis Database
(X-Sight)
Maptis
Chemical Compatibility
(X-Sight)
Document Databases
Maptis
MUA Database
(X-Sight)
Maptis
MIUL Database
(X-Sight)
Maptis
Reference Library
(.net)
Maptis
Memos Database
(.net)
File Serving
MapEM30
EM30 Branch
MapEM30
Material Diagnostic Team
MapEM30
Metallic Materials Engineering Team
MapEM30
Process Development Team
MapEM20
Nondestructive Evaluation Team
Map3
Mechanical Test Team
Map3
EM10 Branch
Map3
EM50 OWIs
Map3
M&A IPT
Resources
Maptis
NASA Tech Standards Prog
(Link-Additional Login)
Maptis
ASM Databases:
Handbooks
Data Sheets & Diagrams
Micrograph Center
Fracture Analysis Center
Alloy Finder
Coatings Data
(Link)
Maptis
Work Request System
(.net)
Access Color Key
Open Access
Limited Access
Additional Login
Open\Limited Access
Server Color Key
Maptis
MapEM30
MapEM20
Map3

In-House MAPTIS Data

- 35,000+ Materials
- 300,000+ records
- Metals and Nonmetals Data
- Data includes Electrical, Flammability, Fluid Compatibility, Fungi, Mechanical, Odor, Outgassing, Toxicity, and more

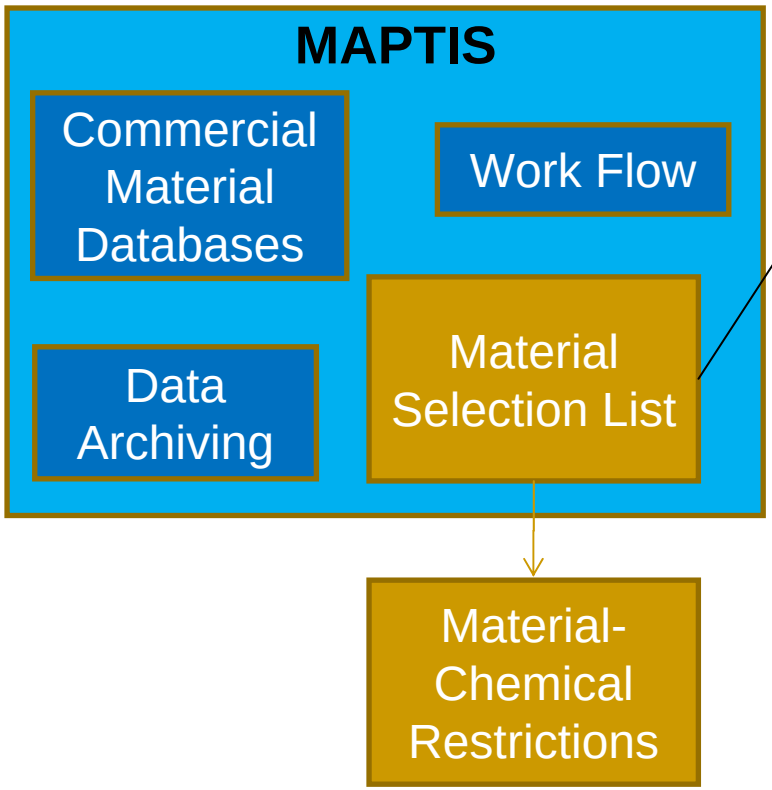
MAPTIS – Awards and Recognitions

www.maptis.nasa.gov

- Our Work Request System and data archiving just received high marks from the ISO audit at MSFC in June 2007
- One NASA Peer Award in 2006
- One NASA Center Best at MSFC Award in 2006

Integration of Restricted Materials-Chemicals

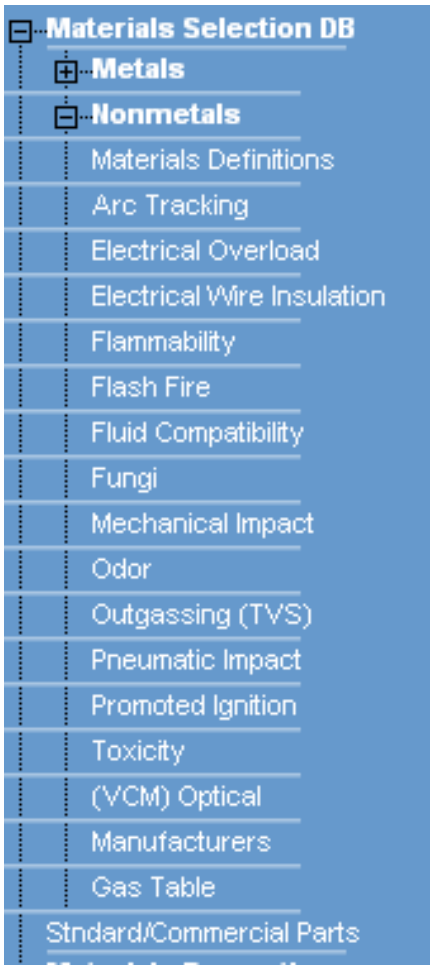
Goal



Material Selection List
35,000 Materials
300,000+ records

- Deliver environmental, safety, and health data to the design engineer
- Improve the tools for the Material & Processing community

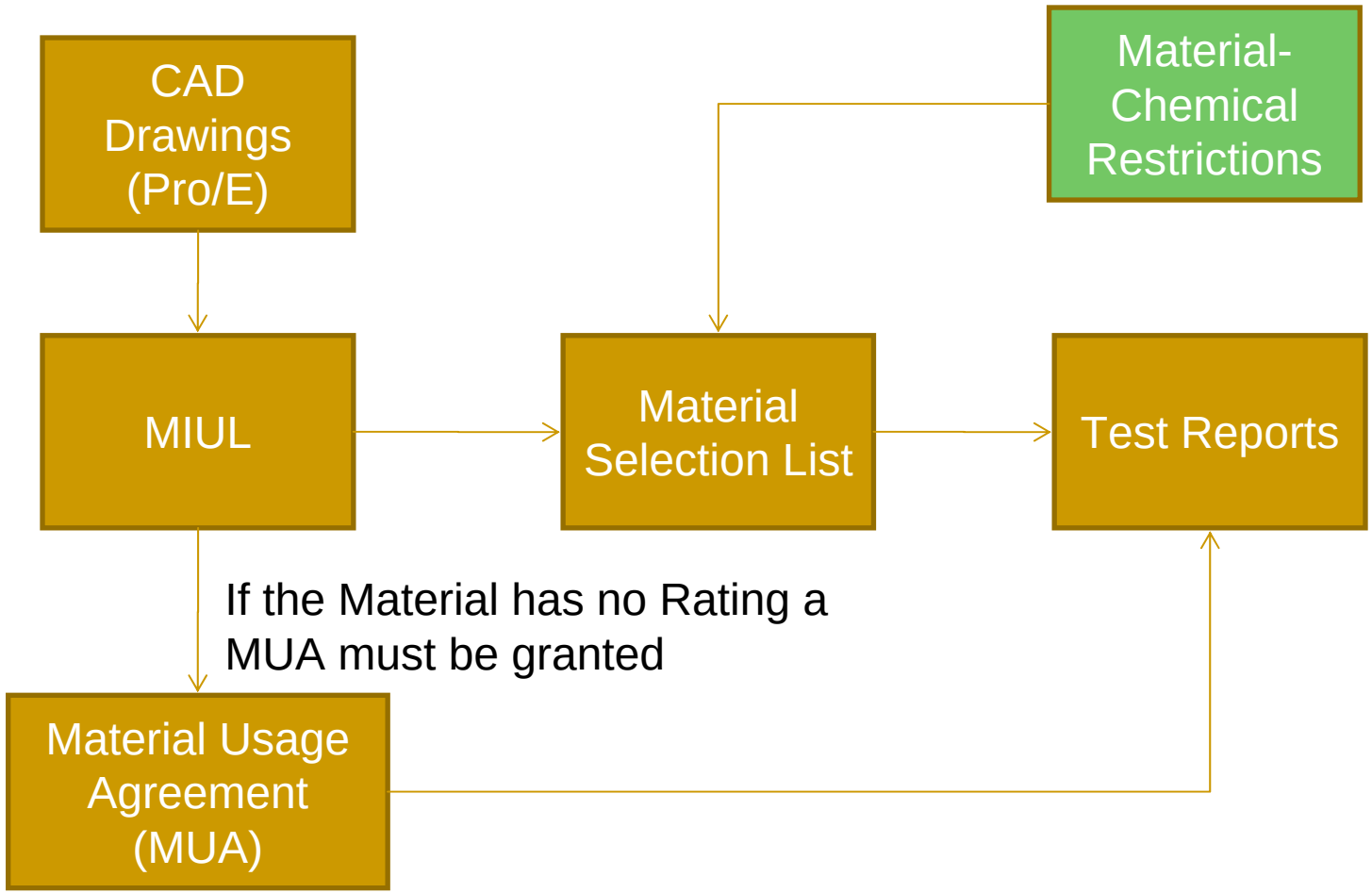
Current Material Selection List (MSL)



- The Material Selection List aids the Design Engineer in finding acceptable materials
- Advanced search options allow the engineer to query the database in a variety of ways
- New ratings are added weekly

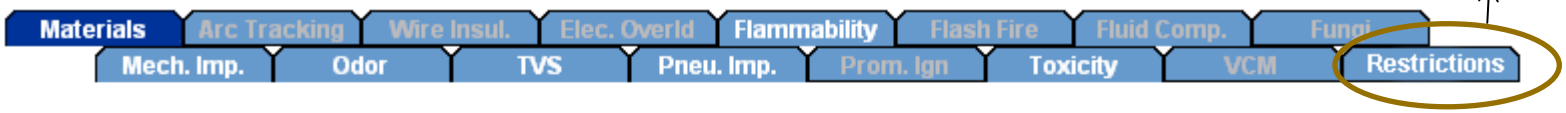
Material In Usage List (MIUL)

or Bill of Material



Material-Chemical Rating

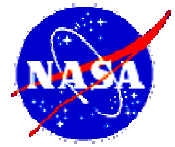
Material-Chemical Information



Non-Metals Material Definition Properties					
Mtrl. Code	61407	Use Temp1 (F)	-100	Use Temp2 (F)	550
Use Type	TUBING, HEAT SHRINK/SLEEVING/TAPE				
Designation	PENNTUBE* PTFE				
Composition	POLYTETRAFLUOROETHYLENE (PTFE)				

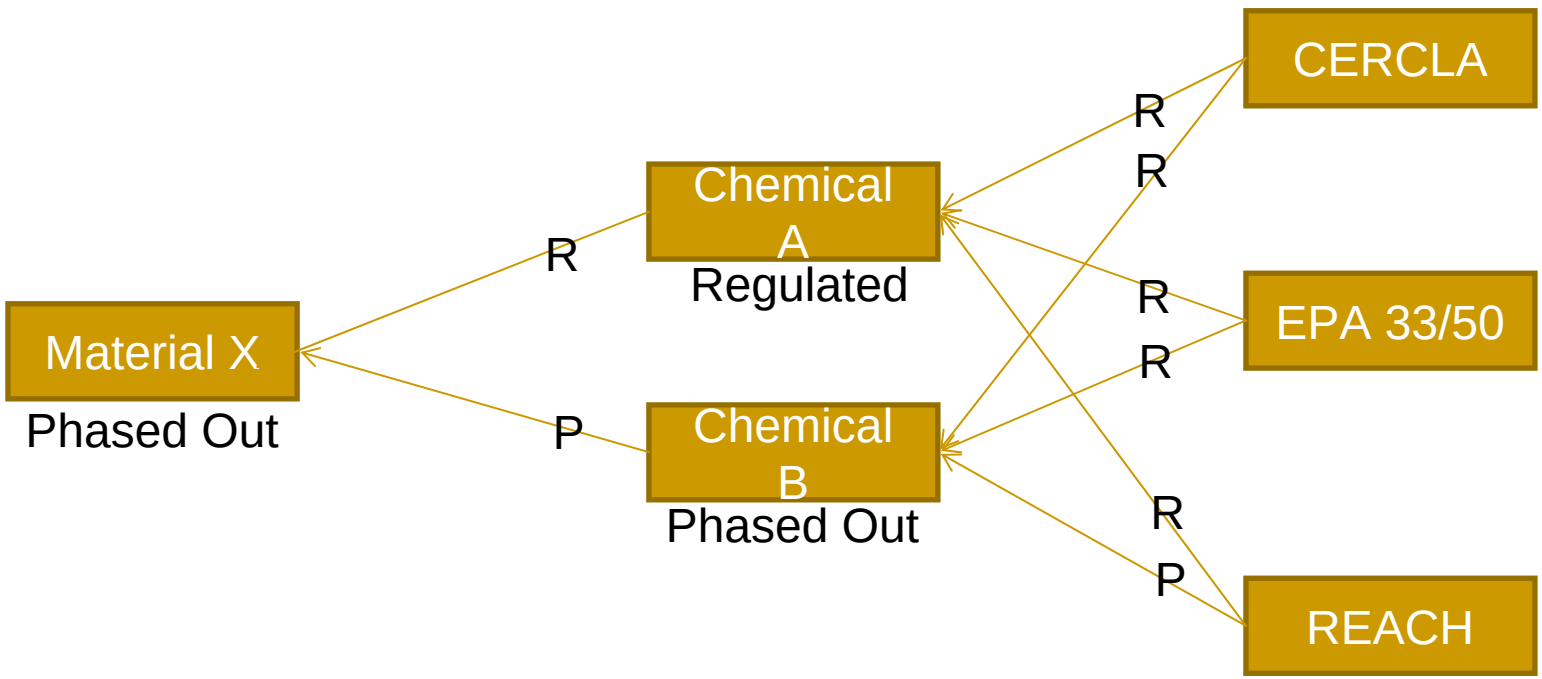
- Restricted Substance Ratings
  - Banned
  - Being Phased Out
  - Regulated
  - Caution
  - Unregulated

Why Restricted Substance Ratings



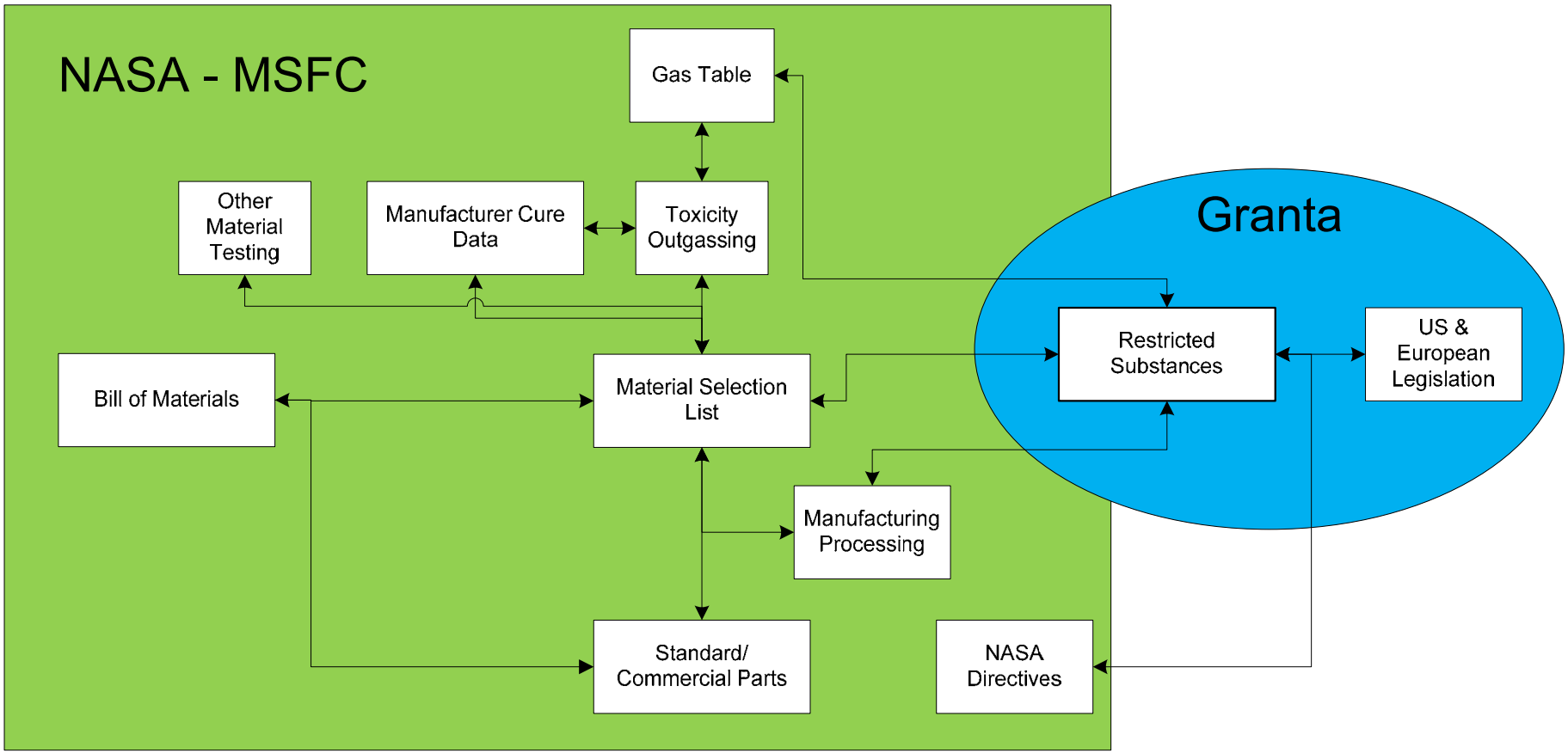
- One material may be listed on multiple pieces of legislation
- Design Engineers are familiar with ratings
- These Ratings will not stop them from using the material, but encourage them to seek advice from the Material & Processing community
- Rating can be produced automatically

Automatic Ratings



R = Regulated P = Phased Out

More Detail Diagram



Restricted Substance Information

Chloroform

NASA Restricted Materials > Restricted Substances

Click on a heading to show/hide the section.

General Information

Chemical Abstracts Service No (CAS No)	67663
EINECS No	200-663-8
NameIndex in SARA list	CHLOROFORM
Molecular formula	CHCl3
Common formula	CHCl3

Synonyms

Chloroforme (French); Cloroformio (Italian); Cloroformo (Spanish); Formyl trichloride; Freon 20; Methane trichloride; Methenyl trichloride; Methyl trichloride; NCI-C02686; R 20 refrigerant; Refrigerant 20; TCM; Trichloormethaan (Dutch); Trichlormethan (Czech); Trichloroform; Trichloromethane; Triclorometano (Italian); Methane, trichloro-

Trade Name

Freon 20, R20, R 20 refrigerant, NCI-C02686, R-20 TCM, UN 1888

Colour of the substance	colourless
Smell of the substance	sweet odour
Last Updated	September 14 2004

Threshold and Reportable Quantities

CERCLA Reportable Quantity	10 lb
Clean Air Act 112(r) Threshold Quantity	20000 lb
EPCRA Section 313	Yes
Hazardous Air Pollutants	Yes
Resource Conservation and Recovery Act Code	U044
Section 302 (EHS) Threshold Planning Quantity	10000 lb
Section 304 EHS Reportable Quantity	10 lb

Environment, Health, and Safety Impacts

Environment	Dangerous for environment
Health	Harmful
Risk Phrases	22-38-40-48/20/22
Safety Phrases	(2-)36/37

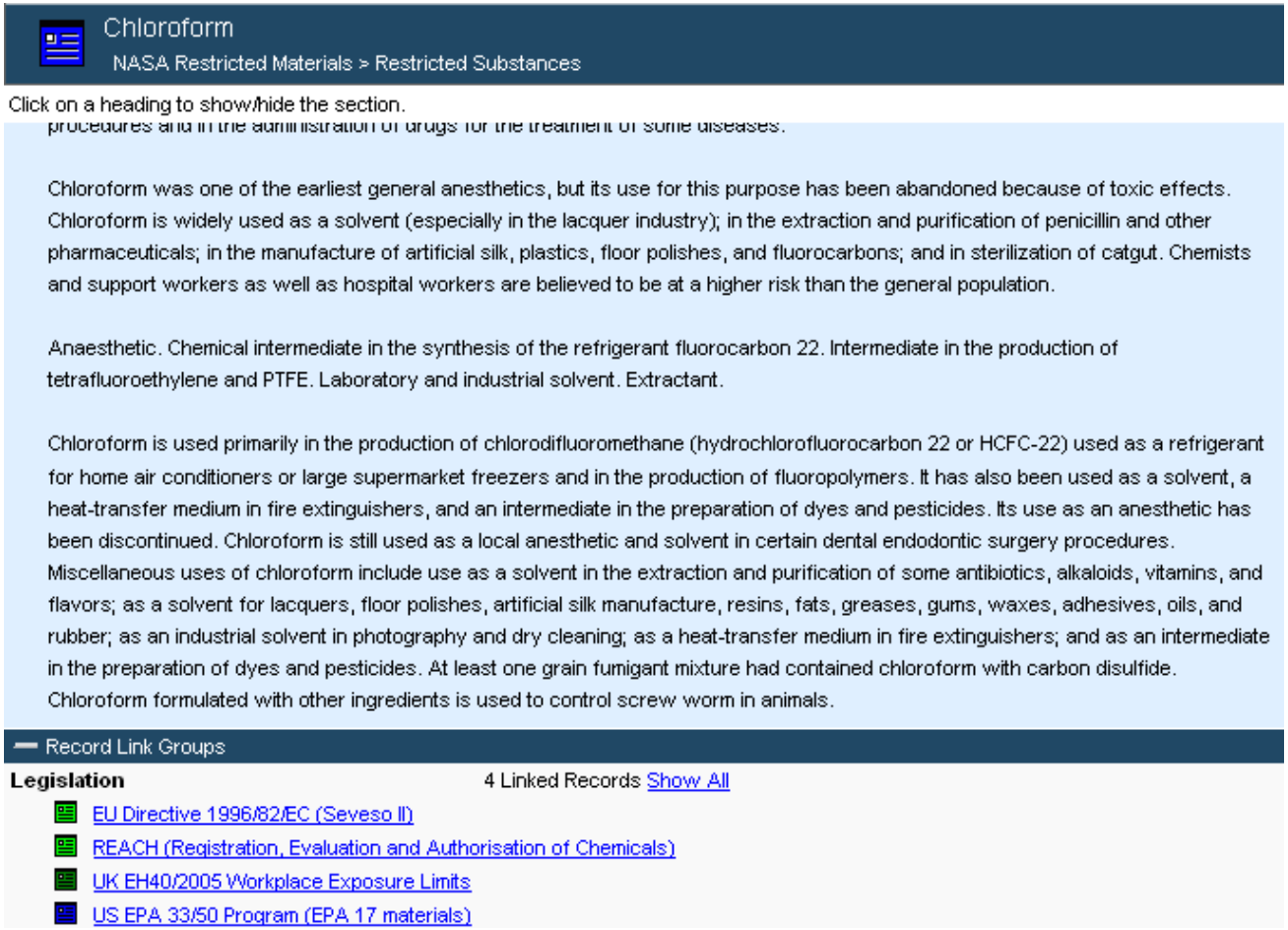
Uses

Typical uses

Chloroform is used primarily in the production of chlorodifluoromethane (hydrochlorofluorocarbon-22 or HCFC-22) used as a refrigerant for home air conditioners or large supermarket freezers and in the production of fluoropolymers (CMR 1995). Chloroform has also been used as a solvent, a heat transfer medium in fire extinguishers, an intermediate in the preparation of dyes and pesticides, and other applications highlighted below. Its use as an anesthetic has been largely discontinued. It has limited medical uses in some dental procedures and in the administration of drugs for the treatment of some diseases.

Chloroform was one of the earliest general anesthetics, but its use for this purpose has been abandoned because of toxic effects.

Restricted Substance Information



Chloroform

NASA Restricted Materials > Restricted Substances

Click on a heading to show/hide the section.

procedures and in the administration of drugs for the treatment of some diseases.

Chloroform was one of the earliest general anesthetics, but its use for this purpose has been abandoned because of toxic effects. Chloroform is widely used as a solvent (especially in the lacquer industry); in the extraction and purification of penicillin and other pharmaceuticals; in the manufacture of artificial silk, plastics, floor polishes, and fluorocarbons; and in sterilization of catgut. Chemists and support workers as well as hospital workers are believed to be at a higher risk than the general population.

Anaesthetic. Chemical intermediate in the synthesis of the refrigerant fluorocarbon 22. Intermediate in the production of tetrafluoroethylene and PTFE. Laboratory and industrial solvent. Extractant.

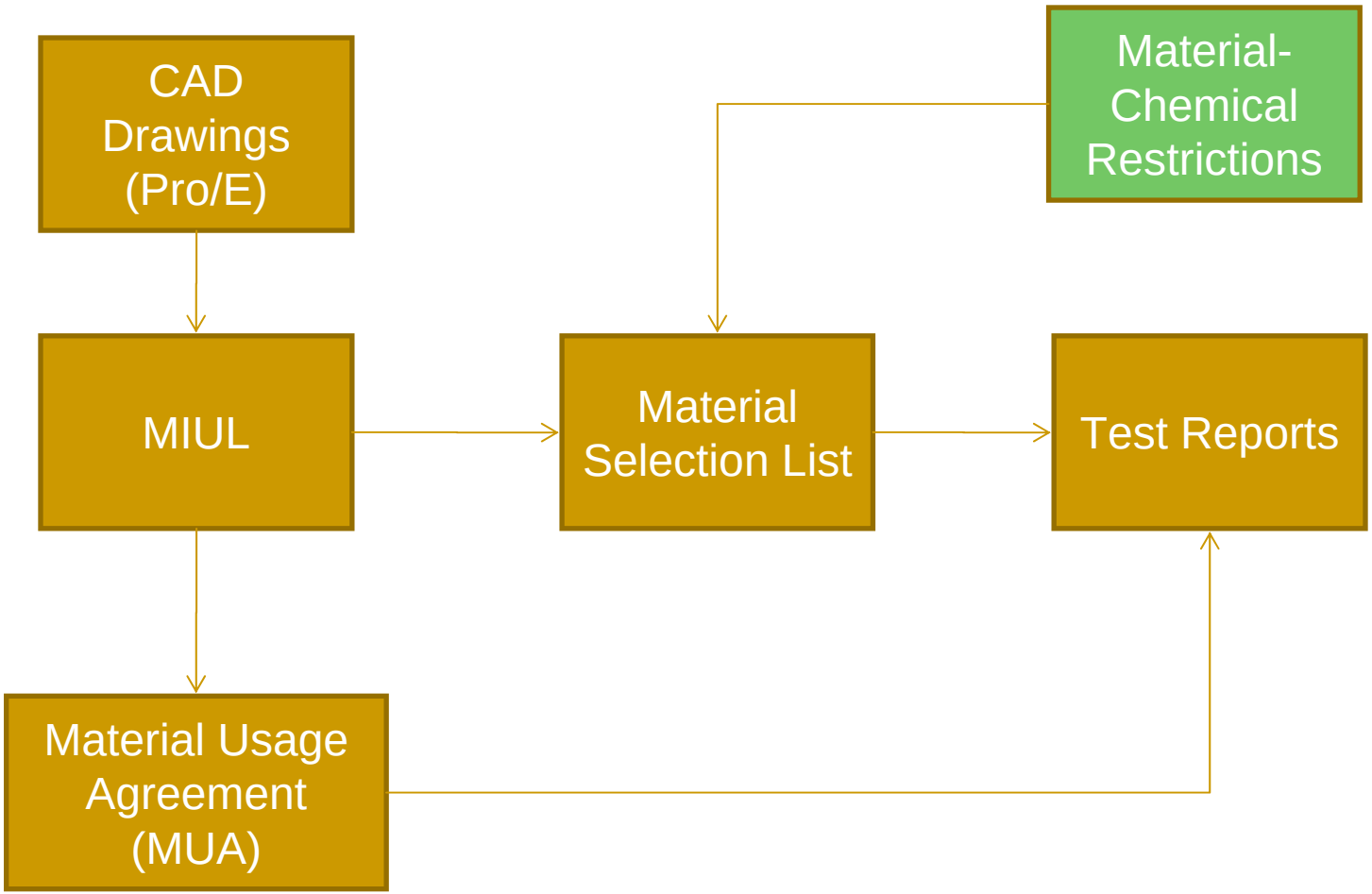
Chloroform is used primarily in the production of chlorodifluoromethane (hydrochlorofluorocarbon 22 or HCFC-22) used as a refrigerant for home air conditioners or large supermarket freezers and in the production of fluoropolymers. It has also been used as a solvent, a heat-transfer medium in fire extinguishers, and an intermediate in the preparation of dyes and pesticides. Its use as an anesthetic has been discontinued. Chloroform is still used as a local anesthetic and solvent in certain dental endodontic surgery procedures. Miscellaneous uses of chloroform include use as a solvent in the extraction and purification of some antibiotics, alkaloids, vitamins, and flavors; as a solvent for lacquers, floor polishes, artificial silk manufacture, resins, fats, greases, gums, waxes, adhesives, oils, and rubber; as an industrial solvent in photography and dry cleaning; as a heat-transfer medium in fire extinguishers; and as an intermediate in the preparation of dyes and pesticides. At least one grain fumigant mixture had contained chloroform with carbon disulfide. Chloroform formulated with other ingredients is used to control screw worm in animals.

Record Link Groups

Legislation 4 Linked Records Show All

- EU Directive 1996/82/EC (Seveso II)
- REACH (Registration, Evaluation and Authorisation of Chemicals)
- UK EH40/2005 Workplace Exposure Limits
- US EPA 33/50 Program (EPA 17 materials)

Tool for Material & Processing



Summary

- A pilot was completed that demonstrated the feasibility of this project
- These Material-Chemical connects would aid the current NASA projects to determine how future EPA regulations would affect them
- Additionally the Restricted Substance Ratings would help guide designers to avoid materials that may have regulatory limitations in 10 to 15 years.